

(2) Electric power sources must function properly when connected in combination or independently.

(3) No failure or malfunction of any source may impair the ability of any remaining source to supply load circuits essential for safe operation.

(4) Each electric power source control must allow the independent operation of each source.

(c) *Generating system.* There must be at least one generator if the system supplies power to load circuits essential for safe operation. In addition—

(1) Each generator must be able to deliver its continuous rated power;

(2) Generator voltage control equipment must be able to dependably regulate each generator output within rated limits;

(3) Each generator must have a reverse current cutout designed to disconnect the generator from the battery and from the other generators when enough reverse current exists to damage that generator; and

(4) Each generator must have an overvoltage control designed and installed to prevent damage to the electrical system, or to equipment supplied by the electrical system, that could result if that generator were to develop an overvoltage condition.

(d) *Instruments.* There must be means to indicate to appropriate crewmembers the electric power system quantities essential for safe operation of the system. In addition—

(1) For direct current systems, an ammeter that can be switched into each generator feeder may be used; and

(2) If there is only one generator, the ammeter may be in the battery feeder.

(e) *External power.* If provisions are made for connecting external power to the rotorcraft, and that external power can be electrically connected to equipment other than that used for engine starting, means must be provided to ensure that no external power supply having a reverse polarity, or a reverse

phase sequence, can supply power to the rotorcraft's electrical system.

(Secs. 313(a), 601, 603, 604, and 605 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421, 1423, 1424, and 1425); and sec. 6(c) of the Dept. of Transportation Act (49 U.S.C. 1655(c)))

[Doc. No. 5074, 29 FR 15695, Nov. 24, 1964, as amended by Amdt. 27–11, 41 FR 55470, Dec. 20, 1976; Amdt. 27–13, 42 FR 36972, July 18, 1977]

§ 27.1353 Storage battery design and installation.

(a) Each storage battery must be designed and installed as prescribed in this section.

(b) Safe cell temperatures and pressures must be maintained during any probable charging and discharging condition. No uncontrolled increase in cell temperature may result when the battery is recharged (after previous complete discharge)—

(1) At maximum regulated voltage or power;

(2) During a flight of maximum duration; and

(3) Under the most adverse cooling condition likely to occur in service.

(c) Compliance with paragraph (b) of this section must be shown by test unless experience with similar batteries and installations has shown that maintaining safe cell temperatures and pressures presents no problem.

(d) No explosive or toxic gases emitted by any battery in normal operation, or as the result of any probable malfunction in the charging system or battery installation, may accumulate in hazardous quantities within the rotorcraft.

(e) No corrosive fluids or gases that may escape from the battery may damage surrounding structures or adjacent essential equipment.

(f) Each nickel cadmium battery installation capable of being used to start an engine or auxiliary power unit must have provisions to prevent any hazardous effect on structure or essential systems that may be caused by the maximum amount of heat the battery can generate during a short circuit of the battery or of its individual cells.

(g) Nickel cadmium battery installations capable of being used to start an engine or auxiliary power unit must have—

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(1) A system to control the charging rate of the battery automatically so as to prevent battery overheating;

(2) A battery temperature sensing and over-temperature warning system with a means for disconnecting the battery from its charging source in the event of an over-temperature condition; or

(3) A battery failure sensing and warning system with a means for disconnecting the battery from its charging source in the event of battery failure.

(Secs. 313(a), 601, 603, 604, and 605 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421, 1423, 1424, and 1425); and sec. 6(c) of the Dept. of Transportation Act (49 U.S.C. 1655(c)))

[Doc. No. 5074, 29 FR 15695, Nov. 24, 1964, as amended by Amdt. 27-13, 42 FR 36972, July 18, 1977; Amdt. 27-14, 43 FR 2325, Jan. 16, 1978]

§ 27.1357 Circuit protective devices.

(a) Protective devices, such as fuses or circuit breakers, must be installed in each electrical circuit other than—

(1) The main circuits of starter motors; and

(2) Circuits in which no hazard is presented by their omission.

(b) A protective device for a circuit essential to flight safety may not be used to protect any other circuit.

(c) Each resettable circuit protective device ("trip free" device in which the tripping mechanism cannot be overridden by the operating control) must be designed so that—

(1) A manual operation is required to restore service after tripping; and

(2) If an overload or circuit fault exists, the device will open the circuit regardless of the position of the operating control.

(d) If the ability to reset a circuit breaker or replace a fuse is essential to safety in flight, that circuit breaker or fuse must be located and identified so that it can be readily reset or replaced in flight.

(e) If fuses are used, there must be one spare of each rating, or 50 percent

spare fuses of each rating, whichever is greater.

(Secs. 313(a), 601, 603, 604, and 605 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421, 1423, 1424, and 1425); and sec. 6(c) of the Dept. of Transportation Act (49 U.S.C. 1655(c)))

[Doc. No. 5074, 29 FR 15695, Nov. 24, 1964; 29 FR 17885, Dec. 17, 1964, as amended by Amdt. 27-13, 42 FR 36972, July 18, 1977]

§ 27.1361 Master switch.

(a) There must be a master switch arrangement to allow ready disconnection of each electric power source from the main bus. The point of disconnection must be adjacent to the sources controlled by the switch.

(b) Load circuits may be connected so that they remain energized after the switch is opened, if they are protected by circuit protective devices, rated at five amperes or less, adjacent to the electric power source.

(c) The master switch or its controls must be installed so that the switch is easily discernible and accessible to a crewmember in flight.

§ 27.1365 Electric cables.

(a) Each electric connecting cable must be of adequate capacity.

(b) Each cable that would overheat in the event of circuit overload or fault must be at least flame resistant and may not emit dangerous quantities of toxic fumes.

(c) Insulation on electrical wire and cable installed in the rotorcraft must be self-extinguishing when tested in accordance with Appendix F, Part I(a)(3), of part 25 of this chapter.

[Doc. No. 5074, 29 FR 15695, Nov. 24, 1964, as amended by Amdt. 27-35, 63 FR 43285, Aug. 12, 1998]

§ 27.1367 Switches.

Each switch must be—

(a) Able to carry its rated current;

(b) Accessible to the crew; and

(c) Labeled as to operation and the circuit controlled.

LIGHTS

§ 27.1381 Instrument lights.

The instrument lights must—